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On the Occurrence of *Bison latifrons* in Comanche County, Kansas.

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FOR two years prior to September, 1925, Mr. James O'Connel, the owner of a large cattle ranch twenty-five miles southeast of Coldwater, Kan., had noticed, projecting from the sandy bank of the creek that flows through his home pasture, an object which looked like the dead root of an old cottonwood tree, both in color and texture. Early in September, 1925, he made a closer examination of the object and found that these appearances had been misleading, as the object proved to have a bony structure, though somewhat different and older looking than the old bison bones usually met with in such situations.

Mr. O'Connel's interest and curiosity being aroused, he at once commenced digging to unearth the specimen, and, if possible, to find out to what sort of animal it had belonged. The loose, sandy matrix soon yielded to his efforts, and in a short time there was exposed to view the fine pair of horn cores, together with parts of the skull, which have furnished the material for this paper.

The resemblance of the specimen to the head of a modern bison was at once noticed and commented upon, and credit must be given to Mr. O'Connel and his family for the ability to recognize in this huge specimen with a spread of horn cores of six feet five inches, a distant relative of our living bison. Credit is also due them for the careful way in which the specimen was removed from the sandy bank.

When found this specimen was embedded in a layer of loose, sandy Pleistocene gravel, about fifteen feet above the present bed of the creek, and directly on top of the red beds, where a shallow, basinlike depression had been formed by the previous action of the creek during high-water freshets. Into this depression the head and horn cores had been washed, settled to the bottom, and been buried

by the sedimentary deposits of the stream. At the point where the specimen was deposited, the creek at that time had evidently turned directly west, along what was then the foot of the high bank of red-bed formation, but which now stands about 300 feet to the south of and parallel to the present course of the creek. From the base of this 35-foot bank the present surface slopes rapidly to the north until, at the exact point where the skull lay, the sandy material had been reduced by erosion until only a feather edge remains, and the tip of one of the horn cores was fully exposed above the surface. That water had played an important part in the deposition of the matrix surrounding the specimen is evidenced by the many thin layers of fine silty sand, interspersed with other layers of black oxide of manganese, which lie in horizontal bands all through the basin, and the sloping mass of debris from the high bank—the whole tinged a rusty-brown color.

Late in September, 1925, the writer paid a short visit to the locality, hoping to find other parts of the specimen, as the nature of the broken parts of the skull suggested that some of the missing pieces might possibly be found, either in the talus of the sandy bank, or in the old bed of the creek, but a thorough search of the immediate vicinity disclosed no indications of the missing parts of either the skull or the rest of the skeleton. It is hoped, however, that sometime in the near future a more thorough examination of the exposures along the banks of the creek may be made. For, prior to the laying down of this Pleistocene deposit of coarse sandy gravel, the creek had gouged out a deep course in the red beds, which later was filled with Pleistocene material, and this in turn is undergoing a secondary erosion, every freshet exposing to view fresh surfaces of likely fossil-bearing strata.

Bison latifrons.

Of the ten or more species of fossil bison described from North America, *Bison latifrons* is the largest and seems to be the rarest, and consequently the least known of all. There appear to be not more than three or four specimens of this species positively known, the finest of which is the pair of magnificent horn cores first described by Harlan, later by Lucas and Hay, which is in the museum of the State Historical Society at Cincinnati, Ohio. In view of the rarity of this species, the additional information and measurements secured from a study of the Coldwater specimen, together with the figures illustrating it, will, I hope, be received with approval.

As will be seen from an examination of the figures, reproduced

from photographs of the specimen from different points of view, it consists of a very fine and almost complete pair of horn cores, together with a sufficient amount of the adjoining skull attached to supply several measurements hitherto not recorded, which may be of value in the study of other and less complete material.

Apparently the Cincinnati specimen lacks a sufficient amount of the adjoining skull to give a positive determination of the general contour and angle of the horns. On the other hand, the Coldwater specimen, as shown by the photographs, reveals clearly the exact angle, as there is firm contact of the horn cores with the skull. A comparison of the size and curvature of the horn cores of the Coldwater specimen with the description and figure of the Cincinnati specimen as given in Lucas' Fossil Bison of America, leaves no room to doubt that they belong to the same species. The suggestion of Hay that the skull and horn cores of the American Museum specimen, described by him as *Bison regius,* may prove to be those of a female of *Bison latifrons,* is well worth consideration, since the sharp upward curve of the horn cores is very much like that in the female of *Bison bison,* where there is a more general inclination towards an upward curve of the horn cores than in the case of the male. Unless later discoveries of the association of horn cores of *Bison latifrons,* like those of the Cincinnati and Coldwater specimens, with the teeth unlike those of *Bison regius,* should be made, it seems probable that sex alone is sufficient to account for the differences between the *Bison regius* of Hay and indubitable *Bison latifrons.*

As shown by the figures, the Coldwater specimen is by no means complete, yet there are sufficient skull parts present to supply additional measurements of the ventral surface of the preoccipital region, as well as of the upper part of the skull from the occipital crest to the level of the frontonasal sutures. As there is perfect contact at the breaks between the horn cores and the skull, there is no doubt as to the correct angle of the horns, whether or not that angle is of any specific value.

In all measurements of the horn cores, as well as of the distance across the skull between their bases, the rough ring at the base of the core is used in each case as the starting point.

With the exception of the tip of each horn core, no attempt has been made to restore the skull, since it is hoped that eventually the missing parts will be found when the contemplated visit to the locality is made, and more time can be given to a more thorough search of the vicinity of the original find.

There is little to be added to the description of the skull by other authors from data supplied by the Cincinnati specimen, except that as the ventral surface of the Coldwater skull appears to be more complete, it may be worth while to append a series of measurements which may be of value in the study of other material.

One noticeable feature of *Bison latifrons* is the great thickness of the horn cores, together with the intricate network of longitudinal and transverse pillars in the interior of the cores at the base; these result in greater strength for the support of the massive horns which this animal carried. This network of trusses extends for a distance of 15 to 18 inches up the otherwise hollow core.

THE FRONTAL PORTION OF THE SKULL.

From the frontal eminence to the fronto-nasal sutures the surface of the frontal bone has the form of a rather level plane, with a slight longitudinal elevation along the median line; in this respect *Bison latifrons* parallels the condition in *Bison occidentalis*, but has no such prominent eminence as has *Bison bison* along the center of the frontal in line with the constriction between the bases of the horn cores and the upper rim of the orbital ring.

It is unfortunate that in the Coldwater specimen both of the horn cores were broken and the tips lost. The right core, with a vertical diameter at the distal end of the fragment of 72 mm., and a transverse diameter at the same level of 56 mm., has been restored only approximately to its original length with a total of 921 mm. Judging, however, from the taper of the distal ends of the Cincinnati specimen, this is too short, and the restored portion of the Coldwater specimen appears to be too stubby and to end too abruptly, so that the probabilities are that it was several inches longer than as restored. It is likely that the distance from tip to tip of the horn cores was originally not less than 6 feet 8 inches, or 2,000 mm.

	Coldwater specimen.	Cincinnati specimen.
Dimensions of horn cores:	mm.	mm.
Length of right horn core, upper curve	810	.....
Length of right horn core, as restored	921	828
Length to end of broken core, lower curve	860	.....
Diameter of core at broken end, vertical	72	.....
Diameter of core at broken end, transverse	56	.....
Diameter of horn core at base, vertical	170	167
Diameter of horn core at base, transverse	155	148
Circumference of right core at base	510	507
Length of restored part of right horn core	111	.....
Length of left horn core to broken end, upper curve	730	.....
Length of left horn core to broken end, lower curve	700	.....
Diameter of left horn core at broken end, vertical	95	.....
Diameter of left horn core at broken end, transverse	80	.....
Diameter of left core at base, vertical	170	.....
Diameter of left core at base, transverse	165	.....
Circumference of left core at base	512	.....
Length of restored part of left core	192	.....
Tip to tip of cores, as restored	1,950	1,800
Tip to tip along upper curve, as restored	2,150	.....
Width of skull between basal rings of cores	360	382
From line joining tips, to frontal eminence	340	.....
From same line to condylar foramen	480	.....
Thickness of core walls at base	60	.....

	Coldwater *B. latifrons.*	*B. occidentalis.*	*B. alleni.*	B. *bison.*
Dimensions of dorsal surface of head:	mm.	mm.	mm.	mm.
Occiptal crest to fronto-nasal suture	345	270	287	225
Width of constriction between cores and orbit	390	302	286	248
Width of nasals at widest part	100	.....	.....	.....
Occipital crest to posterior level of orbits	310	233	232	202
Greatest width (at process over meatus)	300	.....	.....	.....
Width at articulation of lower jaw	270	258	253	225
Width between rings at base of cores	360	.....	.....	.....
Dimensions of under surface of skull:				
Width across occipital condyles	145	.....	.....	135
Condylar crotch to basioccipito-sphenoidal suture	185	.....	.....	145
Diameter of foramen magnum, transverse	45	.....	.....	44
Diameter of foramen magnum, vertical	47	.....	.....	50
Width across condylar foramen, transverse	40	.....	.....	.....
Width across condylar foramen, vertical	45	.....	.....	.....
Length of tympanic bulla	70	.....	.....	50
Width of tympanic bulla	25	.....	.....	21
Upper border of foramen magnum to supra-occ	116	.....	.....	90
Width across glenoid fossæ (outside)	272	.....	.....	230
Width at auditory meatus	308	.....	.....	240
Width in line with upper margin of foramen magnum,	309	.....	.....	245
Articular surface of glenoid fossa	40	.....	.....	33
Height of occipital crest above lower lip of foramen magnum	???	.....	.....	145

Through the kindness of Earl O'Connel, a son of Mr. James O'Connel, I am able to give the following description of the location of the land on which the specimen was found:

On Cottonwood creek, in section 6, township 35, range 17 west, Comanche county, Kansas, 1½ miles north of the Kansas-Oklahoma state line.

To one of the graduates of the University of Kansas, Mr. Horace Rich, an attorney of Coldwater, I wish here to express my thanks and appreciation of his kindness in generously devoting a whole day to the task of driving me out to the O'Connel ranch and around over the immediately surrounding country, to make an examination of the geological formations in the neighborhood, upon the occasion of the trip to Coldwater made to investigate a newspaper report of the find.

In conclusion I should like to add that this specimen was very graciously presented to the writer for friendship's sake by Mr. O'Connel, to be retained as my personal property, and I hereby extend to him publicly my appreciative thanks and acknowledgment of his generosity.

PLATE XLII.

Photographs of horn cores and part of skull of *Bison latifrons,* from Coldwater, Kan.

UPPER FIGURE. Full front view showing degree of angle of the horn cores, with the vertical face of the skull.

MIDDLE FIGURE. The horn cores slightly tilted backward to show the approximate curvature of the horn cores, if the animal stood in an attitude of rest.

LOWER FIGURE. Part of skull of full-grown *Bison bison* for comparison.

PLATE XLII.

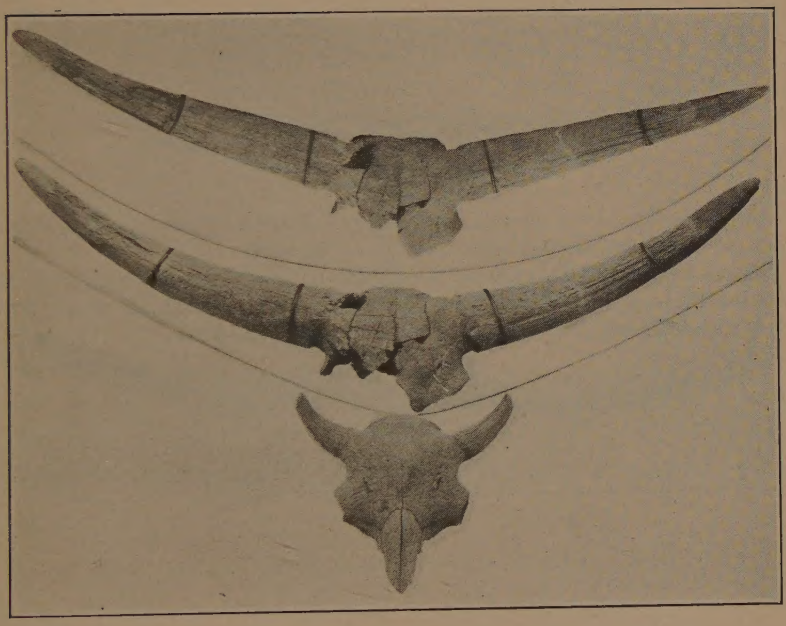
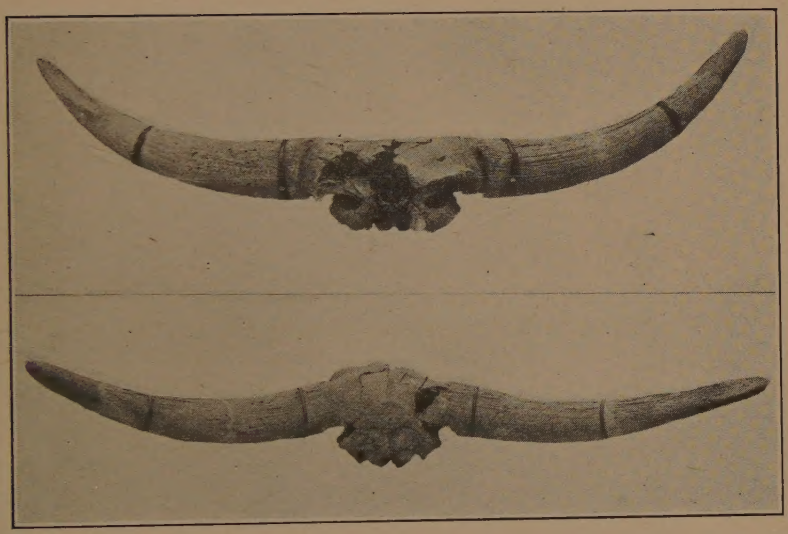


PLATE XLIII.

UPPER FIGURE. Front view of horn cores of *Bison latifrons* from Coldwater, Kan., in a position to show full curvature of the horns.

LOWER FIGURE. Back view of the Coldwater specimen of *Bison latifrons*, showing the occipital condyle and horn cores. Note the angle of the horn cores with reference to the flattened plane of the frontal bone.

PLATE XLIII.



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